

FORM PTO-1390 (REV 11-98)		ATTORNEY DOCKET NUMBER 6009-4601US
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.51) TBA 09/787348
INTERNATIONAL APPLICATION PCT/FI99/00782	INTERNATIONAL FILING DATE 23 September 1999 (23.09.99)	PRIORITY DATE CLAIMED 24 September 1998 (24.09.98)
TITLE OF INVENTION METHOD FOR MANUFACTURING OF A CATHODE SUSPENSION BAR		
APPLICANT(S) FOR DO/EO/US MARTTILA, Tom		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371 (b) and PCT Articles 22 and 39 (1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is transmitted herewith. b. <input type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input type="checkbox"/> A translation of the International application into English (35 U.S.C. 371(c)(2)), with oath 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (executed) 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). 		
Items 11. to 16. below concern document(s) or information included.		
<ol style="list-style-type: none"> 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification and Figs. 1 and 2. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input checked="" type="checkbox"/> Other items or Information: <ul style="list-style-type: none"> • Copy of Notice Informing the Applicant of the Communication of the International Application to the Designated Offices. • Copy of Notification of Transmittal of International Preliminary Examination Report. • Copy of International Application Published Under the Patent Cooperation Treaty (PCT). • Check in the amount of \$1328.00 • Return postcard. • 		

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.51)		INTERNATIONAL APPLICATION NO.		ATTORNEY'S DOCKET NO.	
TBA 09/787348		PCT/FI99/00782		6009-4601US	
17. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO.....\$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ...\$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2) paid to USPTO.....\$710.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33 (1) - (4).....\$690.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1) - (4).....\$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				\$1000.00	
Surcharge of \$130 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$-- 0.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$ 0.00	
Total claims	21 - 20	1	X \$18.00	\$ 18.00	
Independent claims	1-3	0	X \$80.00	\$-- 0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$270.00	
TOTAL OF ABOVE CALCULATIONS =				\$1288.00	
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$ 0.00	
SUBTOTAL =				\$1288.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$--	
TOTAL NATIONAL FEE =				\$1288.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property =				\$ 40.00	
TOTAL FEES ENCLOSED				\$1328.00	
				Amount to be refunded:	\$
				charged	\$ \$0.00
a. <input checked="" type="checkbox"/> A check in the amount of \$1328.00 cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 13-4500 in the amount of \$0.00 to cover the above fees. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-4500, ORDER NO. 6009-4601US . A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: Morgan & Finnegan LLP 345 Park Avenue New York, NY 10154-0053 Telephone: 212-758-4800 Telecopier: 212-751-6849			Israel Blum Registration Number 26, 710		

METHOD FOR MANUFACTURING OF A CATHODE SUSPENSION BAR

The present invention relates to a method for manufacturing a suspension bar for a permanent cathode used in the electrolysis of metals, wherein the suspension bar is formed of a rigid metal outer jacket and a highly
5 conductive core attached inside it. By this method, a good connection is achieved between the outer jacket and the core. This connection is made by drawing, upsetting, melting or casting.

10 In the electrolysis of metals, a traditional method involves the use of starting sheets which are first grown on the surfaces of mother plates. Using this kind of starting sheets then as cathodes which are of the same metal as the metal to be precipitated, eg copper, is being phased out especially when new investments are concerned. When building new electrolysis tank
15 houses, the trend has been towards the use of permanent cathodes and the sheet-like part of the cathode is generally is made from acid-resistant steel or titanium.

Permanent cathodes have been manufactured in many different ways, the
20 principal difference being in the structure of the cathode suspension bar and the fastening of the plate part to the suspension bar. The structure of the suspension bar and attaching the plate part are problematic in that in order to conduct a large electric current to the plate part, there has to be enough copper in the suspension bar. Since acid-resistant steel is a poor conductor,
25 it cannot be the sole material used in the bar.

There are several methods in the prior art to solve the combination of copper and another metal in the manufacture of the suspension bar of permanent cathodes. The commercial market is dominated by two forms of
30 construction. The first of these uses an all-copper suspension bar, to which an acid-resistant steel plate part is welded using a specially alloyed welding

wire. One drawback of this method is the softness of a suspension bar made wholly of copper, as a consequence of which the bar is easily deformed, especially if larger cathode weights are used. A temperature increase caused by short circuits further exacerbates this problem.

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A second disadvantage of the all-copper suspension bar is that it is difficult to attach separate lifting lugs firmly enough to the suspension bar, which lifting lugs will be on the top of the suspension bar as required by state-of-the-art material handling. The third disadvantage is that the special alloy welding required for attaching the acid-resistant steel plate part and the copper suspension bar is not at all as corrosion-resistant as the other parts of the cathode. The advantages of this construction are that making this kind of permanent cathode is quick, requires low investments and there are no special demands as to the location of the fabrication process.

10 Another advantage is the large cross-sectional area of copper in the suspension bar, which leads to low resistance and consequently low power losses in the actual structure of the permanent cathode.

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In the second, widely used construction of a permanent cathode suspension bar, a tubular suspension bar core is made of stainless or acid-resistant steel. An acid-resistant plate part is welded with welding wire conventional to these materials. After being attached, the suspension bar and the uppermost part of the plate part, where the welds are located, are plated electrolytically with copper in order to achieve adequate electroconductivity.

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25 Copper plating also protects the welds from environmental impact. This method is described for example in GB patent 2,040,311.

The most notable disadvantage of the method described above is that the electrolytic plating requires a long time, several days, as a result of which production throughput time increases considerably and the electroplating demands large investments in equipment. Because of the electroplating,

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the fabrication line must be in the immediate vicinity of an operational electrolysis tankhouse. In this construction, the cross-sectional surface of the copper is smaller than for example in the previously described construction, where the suspension bar is all copper. This in turn leads to
5 the presently described permanent cathode having a slightly higher resistance in its own construction and the ensuing energy losses are greater than when an all-copper suspension bar is used. On the other hand, a steel-core suspension bar does have great durability whereby the permanent cathode will keep its shape well even with great cathode weights,
10 nor do short-circuits cause problems to the life time of the cathode. It is also much easier to attach the above-mentioned separate lifting lugs to this kind of construction. The lifting lugs are welded secure to the steel core of the bar before electrolytic copper plating, which makes the construction strong and durable. In this design, all welds occur between the steel parts and
15 remain under the copper plating, thereby making the connections strong and longlasting.

US patent 4,647,358 describes a further permanent cathode, where the outermost part of the suspension bar is manufactured from steel pipe,
20 attached to the plate part by welding. A hollow copper pipe is placed inside the suspension bar steel pipe, which is either longer than the steel pipe or the steel pipe is at least partially open at the ends so that the current flow occurs via the copper inner pipe of the suspension bar. The internal diameter of the steel pipe is almost that of the outer diameter of the copper
25 pipe so that the pipes are in close contact with each other. The outer jacket, of which the manufacturing method is described in the patent, is initially open longitudinally so that the inner tube is easier to position and after installing the inner pipe the outer jacket is attached to the pipe longitudinally by welding. Both the inner pipe and outer jacket at the ends of the bar are
30 welded to each other.

- Advantages of the previously described method are the great strength of the bar and also that both the cathode plate part and the separate lifting lugs can be welded directly to the jacket section which is of the same metal. The disadvantage however, is that, in order to achieve proper contact, separate welds and/or blanking between the jacket and the core are required. As a result, in large production quantities it is difficult to get bars of uniform quality. Another disadvantage is that the jacket and the core have to be welded together at the ends so that the construction will be tight and not exposed to corrosion, since any electrolyte getting between the jacket and the core is not good for the long-term durability of the bar. Production therefore requires numerous working steps that are difficult to automate, so that the high costs of production become a problem and as already mentioned, the assurance of uniform quality may be overwhelming.
- This invention focuses on a method to manufacture a permanent cathode suspension bar used in the electrolysis of metals, whereby the suspension bar is fabricated from a rigid metal outer jacket inside which a highly electroconductive core is placed either by drawing, upsetting, melting or casting. The aim of these techniques is to achieve a sufficiently good electrical contact and tightness between the jacket and the core without any additional working steps. The most preferable is to achieve a metallurgical bond between the parts of the bar. Thus, it is enough, after joining the jacket and the core, that the jacket is machined partially open at one end at least to generate a good electrical contact between the cathode suspension bar and the tank busbar. The essential features of the invention will become apparent in the attached patent claims.

The text mainly refers to copper as the highly electroconductive core metal, but it can also be aluminium. The rigid metal outer jacket is preferably manufactured from refined steel so that it may be acid-resistant or stainless steel.

When the suspension bar is formed by drawing, a highly electroconductive core is made for the bar by drawing copper through the inside of the ready outer jacket. When the outer jacket is for example made of refined steel, the easiest way is to do it beforehand, as refined steel is difficult to draw. This will preferably happen so that a tubular preform suitable for the inside of the steel jacket is made of copper. This preform is put inside the steel jacket and an arbor is drawn through the hole in the copper preform in the drawing machine, which forces the copper tightly against the surface of the steel jacket. A steel bar can also be used as an arbor either drawn or pushed into the hole in the copper preform and if required can also be left inside the finished bar. During production, the steel jacket can, if necessary, be supported from outside in order to prevent deforming. The shaping of the copper and its binding to the steel can be affected by adjusting the temperature.

A permanent cathode suspension bar can also be fabricated by upsetting, whereby a suitable core is set inside the outer jacket so that by pressing the ends of the core it may be extruded very tight to the jacket at least at the important places i.e. at the ends. The temperature can be adjusted to favour the shaping of the copper as in drawing. Depending on the temperature used, a metallurgical contact between the jacket and the core can be made also by drawing or upsetting.

Fabricating of the suspension bar by melting is done so that a copper core preform which is beforehand made by, for example, casting, drawing or machining, is first put in solid form inside the steel jacket and then melted there by heating the jacket and the core preform. Melting can be done in a vertical position when it is preferential to plug the lower end of the steel tube. Then the tube both supports the core preform and retains the molten copper inside the jacket tube. During the heat treatment, the jacket remains

in sufficiently solid form. The bond between steel and copper can be adjusted with the temperature and with the time the copper is kept in molten condition, and by using a suitable combination a metallurgical bond is achieved.

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When the suspension bar is fabricated by casting, it is done so that the outer jacket of steel tube acts as a mould inside which the copper core is cast directly. However, the jacket remains in sufficiently solid form. Any potential adhering of the copper to the outer surface of the steel jacket can
10 be prevented by, for example, graphite solution treatment or some other coating. By casting molten copper inside the solid steel jacket, a reliable metallurgical bond between the steel and the copper can be formed.

The casting itself occurs e.g. by pouring molten core metal inside an upright
15 steel tube, which is closed at the lower end. It is preferable to preheat the steel jacket powerfully or to additionally heat the whole bar (jacket + core) after pouring the melt. It is essential that the jacket is enough long time in actual contact with the molten copper so that a metallurgical bond has time to form between the jacket and the core. If the jacket tube is not heated in
20 advance, or the whole bar during or after casting, there will be no cracking, but the core metal will solidify so quickly on the cold inner wall of the jacket that no bond will be form.

Another method of filling the steel jacket is to immerse it in copper melt for
25 enough long time when preheating is maybe not necessary at all. Immersion can be made with the tube in a horizontal position, in which case before immersing the steel jacket both ends are plugged and a sufficient number of holes are made in the upper side of the tube for the feed of the copper and the release of air. A suitable amount is for example one hole at either end of
30 the tube. The tube may also be held in an inclined position to ensure the melt fills the inside. Immersion may also of course be made in a vertical

position, wherein only the lower end of the steel jacket is plugged before immersion. For example, immersion for approximately one minute is sufficient to obtain a good end result.

- 5 As previously found, a contact of good electroconductive metals is desired between the permanent cathode and the electrolytic tank busbar, so that the current flows between them with little loss. This is easy to achieve with a drawn, upset, smelted or cast core so that, for example, after connecting the parts of the bar, the steel jacket can be removed from one side of the bar, at
10 either both ends or only one end, at a suitable length from the face of the copper core. At the same time, the cross-sections of the copper contact of the bar can be formed to the required shape, for instance, cambered.

- Separate lifting lugs made of refined steel are welded as required directly to
15 the steel jacket of the suspension bar. Likewise, the cathode plate part is welded directly to the steel jacket. The plate part and lifting lugs can be attached to the suspension bar steel jacket either before the copper core is attached or afterwards and the welds are always made joining pieces of the same material so they are easy to do and durable.

PATENT CLAIMS

1. A method for manufacturing a suspension bar for a permanent cathode used in an electrolysis of metals, wherein the suspension bar is made of a rigid metal outer jacket and a highly electroconductive inner part inside it, after which the outer jacket is removed at least from one end of the bar, characterized in that a refined steel outer jacket and a highly electroconductive core are in close contact with each other, wherein the parts of the bar are joined to each other by drawing, upsetting, melting or casting.
2. A method according to claim 1, characterized in that the highly electroconductive core is copper.
3. A method according to claim 1, characterized in that the highly electroconductive material is aluminium.
4. A method according to claim 1, characterized in that the core is connected to the outer jacket by placing a core preform inside the outer jacket and by drawing an arbor through the preform in a drawing machine.
5. A method according to claim 4, characterized in that a steel bar is used as the arbor.
6. A method according to claim 5, characterized in that the steel bar is left inside the highly electroconductive core.
7. A method according to claim 1, characterized in that the core is connected to the outer jacket by placing a core preform inside the outer jacket and by pressing the ends of the core, so that the core is extruded tight to the jacket.

8. A method according to claim 1, **characterized in that** in order to obtain a metallurgical bond between the jacket and the core, the core is attached to the jacket by casting it in molten form inside the solid jacket.

5 9. A method according to claim 8, **characterized in that** casting is made using the outer jacket as the mould into which the molten core metal is poured.

10 10. A method according to claim 1, **characterized in that** in order to obtain a metallurgical bond between the jacket and the core, the core preform is placed in solid form inside the outer jacket and then the core is melted inside the outer jacket which remains in sufficiently solid form.

15 11. A method according to claim 8 or 10, **characterized in that** the outer jacket is preheated before bonding.

12. A method according to claim 8 or 10, **characterized in that** the outer jacket and the core are heated during bonding.

20 13. A method according to claim 8 or 10, **characterized in that** the outer jacket and the core are heated after bonding.

25 14. A method according to claim 8 or 10, **characterized in that** the outer jacket is held in a vertical position with the bottom end closed when core metal is put into the jacket.

15. A method according to claim 8, **characterized in that** casting is made by immersing the outer jacket into a melt of core metal.

16. A method according to claim 15, **characterized in that** the outer jacket is immersed in the melt essentially in a horizontal position, wherein the ends of the jacket are closed and that holes are made in the upper part of the jacket for pouring the melt and releasing air.

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17. A method according to claim 15, **characterized in that** the outer jacket is immersed in the melt essentially in a vertical position, wherein the bottom end of the jacket is closed.

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ABSTRACT

The present invention relates to a method for manufacturing a suspension
5 bar for a permanent cathode used in the electrolysis of metals, wherein the
suspension bar is formed of a rigid metal outer jacket and a highly
conductive core attached inside it. By means of this connection, a tight
contact is achieved between the outer jacket and the core and this
connection is made by drawing, upsetting, melting or casting.

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The present invention relates to a method for manufacturing a suspension bar for a permanent cathode used in the electrolysis of metals, wherein the suspension bar is formed of a rigid metal outer jacket and a highly conductive core attached inside it. By means of this connection, a tight contact is achieved between the outer jacket and the core and this connection is made by drawing, upsetting, melting or casting.

Docket No. _____

**COMBINED DECLARATION AND POWER OF ATTORNEY FOR
ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL
DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART APPLICATION**

As a below name inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Method for manufacturing of a cathode suspension bar
the specification of which

a. ☐ is attached hereto

b. ☐ was filed on _____ as application Serial No. _____ and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

c. ☒ was described and claimed in International Application No. PCT/FI99/00782
as amended on _____ (if any). filed on 23 September 1999 and

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby specify the following as the correspondence address to which all communications about this application are to be directed:

SEND CORRESPONDENCE TO:

MORGAN & FINNEGAN, L.L.P
345 Park Avenue
New York, N.Y. 10154

DIRECT TELEPHONE CALLS TO: _____
(212) 758-4800

☐ I hereby claim foreign priority benefits under Title 35, United States Code § 119(a)-(d) or under § 365(b) of any foreign application(s) for patent or inventor's certificate or under § 365(a) of any PCT international application(s) designating at least one country other than the U.S. listed below and also have identified below such foreign application(s) for patent or inventor's certificate or such PCT international application(s) filed by me on the same subject matter having a filing date within twelve (12) months before that of the application on which priority is claimed:

☐ The attached 35 U.S.C. § 119 claim for priority for the application(s) listed below forms a part of this declaration.

<u>Country/PCT</u>	<u>Application Number</u>	<u>Date of filing (day, month, yr)</u>	<u>Date of Issue (day, month, yr)</u>	<u>Priority Claimed</u>
Finland	982060	24/09/1998		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
				<input type="checkbox"/> YES <input type="checkbox"/> NO
				<input type="checkbox"/> YES <input type="checkbox"/> NO

☐ I hereby claim the benefit under 35 U.S.C. § 119(e) of any U.S. provisional application(s) listed below.

Provisional Application No.

Date of Filing (day, month, yr)

**ADDITIONAL STATEMENTS FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART
OR PCT INTERNATIONAL APPLICATION(S) (DESIGNATING THE U.S.)**

I hereby claim the benefit under Title 35, United States Code § 120 of any United States application(s) or under § 365(c) of any PCT international application(s) designating the U.S. listed below.

<u>US/PCT Application Serial No.</u>	<u>Filing Date</u>	<u>Status (patented, pending, abandoned)/ U.S. application no. assigned (For PCT)</u>
<u>US/PCT Application Serial No.</u>	<u>Filing Date</u>	<u>Status (patented, pending, abandoned)/ U.S. application no. assigned (For PCT)</u>

☐ In this continuation-in-part application, insofar as the subject matter of any of the claims of this application is not disclosed in the above listed prior United States or PCT international application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or Imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorneys and/or agents with full power of substitution and revocation, to prosecute this application, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith: John A. Diaz (Reg. No. 19,550), John C. Vassil (Reg. No. 19,098), Alfred P. Ewert (Reg. No. 19,887), David H. Pfeffer (Reg. No. 19,825), Harry C. Marcus (Reg. No. 22,390), Robert E. Paulson (Reg. No. 21,046), Stephen R. Smith (Reg. No. 22,615), Kurt E. Richter (Reg. No. 24,052), J. Robert Dailey (Reg. No. 27,434), Eugene Moroz (Reg. No. 25,237), John F. Sweeney (Reg. No. 27,471), Arnold I. Rady (Reg. No. 26,601), Christopher A.

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Hughes (Reg. No. 26,914), William S. Feiler (Reg. No. 26,728), Joseph A. Calvaruso (Reg. No. 28,287), James W. Gould (Reg. No. 28,859), Richard C. Komson (Reg. No. 27,913), Israel Blum (Reg. No. 26,710), Bartholomew Verdirame (Reg. No. 28,483), Maria C.H. Lin (reg. No. 29,323), Joseph A. DeGirolamo (Reg. No. 28,595), Michael A. Nicodema (Reg. No. 33,199), Michael P. Dougherty (Reg. No. 32,730), Seth J. Atlas (Reg. No. 32,454), Andrew M. Riddles (Reg. No. 31,657), Bruce D. DeRenzi (Reg. No. 33,676), Michael M. Murray (Reg. No. 32,537), Mark J. Abate (Reg. No. 32,527), Alfred L. Haffner, Jr. (Reg. No. 18,919), Harold Haidt (Reg. No. 17,509), John T. Gallagher (Reg. No. 35,516), Steven F. Meyer (Reg. No. 35,613) and Kenneth H. Sonnenfeld (Reg. No. 33,285) of Morgan & Finnegan, L.L.P. whose address is: 345 Park Avenue, New York, New York, 10154; and Edward A. Pennington (Reg. No. 32,588), Michael S. Marcus (Reg. No. 31,727) and John E. Hoel (Reg. No. 26,279) of Morgan & Finnegan, L.L.P., whose address is 1775 Eye Street, Suite 400, Washington, D.C. 20006.

X[X] I hereby authorize the U.S. attorneys and/or agents named hereinabove to accept and follow instructions from Outokumpu Oyj, Riihitontuntie 7, FIN-02200 Espoo as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and/or agents and me. In the event of a change in the person(s) from whom instructions may be taken I will so notify the U.S. attorneys and/or agents hereinabove.

1-00
Full name of sole or first inventor MARTTILA, Tom

Inventor's signature* [Signature]

26 February 2001

Residence Verkkokuja 7 B, Espoo, Finland

date

Citizenship Finnish

Post Office Address Verkkokuja 7 B, FIN-02230 Espoo, Finland

Full name of second joint inventor, if any _____

Inventor's signature* _____

date

Residence _____

Citizenship _____

Post Office Address _____

[] ATTACHED IS ADDED PAGE TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR SIGNATURE BY THIRD AND SUBSEQUENT INVENTORS FORM.

* Before signing this declaration, each person signing must:

1. Review the declaration and verify the correctness of all information therein; and
2. Review the specification and the claims, including any amendments made to the claims.

After the declaration is signed, the specification and claims are not to be altered.

To the inventor(s):

The following are cited in or pertinent to the declaration attached to the accompanying application:

Title 37, Code of Federal Regulation, § 1.56

Duty to disclose information material to patentability.

(a) A patent by its very nature is affect with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

- (1) prior art cited in search reports of a foreign patent office in a counterpart application, and
- (2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

Title 35, U.S. Code § 101

Inventions patentable

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Title 35 U.S. Code § 102

Conditions for patentability; novelty and loss of right to patent

A person shall be entitled to a patent unless –

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent,
- (b) the invention was patented or described in a printed publication in this or foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States, or

(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other ...

Title 35, U.S. Code § 103

Conditions for patentability; non-obvious subject matter

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Title 35, U.S. Code § 112 (in part)

Specification

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise and exact terms also enable any person skilled in the art to which it pertains, or with which it is mostly nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Title 35, U.S. Code § 119

Benefit of earlier filing date in foreign country; right of priority

An application for patent for an invention filed in this country by any person who has, or whose legal representatives or assigns have, previously regularly filed an application for a patent for the same invention in a foreign country which affords similar privileges in the case of applications filed in the United States or to citizens of the United States, shall have the same effect as the same application would have if filed in this country on the date on which the application for patent for the same invention was first filed in such foreign country, if the application in

this country is filed within twelve months from the earliest date on which such foreign application was filed; but no patent shall be granted on any application for patent for an invention which had been patented or described in a printed publication in any country more than one year before the date of the actual filing of the application in this country, or which had been in public use or on sale in this country more than one year prior to such filing.

Title 35, U.S. Code § 120

Benefit or earlier filing date in the United States

An application for patent for an invention disclosed in the manner provided by the first paragraph of section 112 of this title in an application previously filed in the United States, or as provided by section 363 of this title, which is filed by an inventor or inventors named in the previously filed application shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting or abandonment of or termination of proceedings on the first application or an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application.

Please read carefully before signing the Declaration attached to the accompanying Application.

If you have any questions, please contact Morgan & Finnegan, L.L.P.

FORM:COMB-DEC.NY
Rev. 5/21/98